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TECHNICAL REPORT

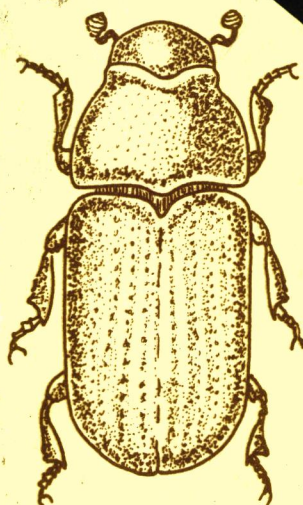
R-3 77-14

SIMULATED YIELD TABLES FOR DWARF
MISTLETOE MANAGEMENT IN PONDEROSA
PINE STANDS (SWYLD2 PROGRAM)

PHASE I. TWO-STORIED STANDS

Quemado and Silver City
Ranger Districts
Gila National
Forest
New Mexico

1977



Southwestern Region

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TECHNICAL REPORT

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PHASE I. TWO-STORIED STANDS

Quemado and Silver City Ranger Districts
Gila National Forest
New Mexico

1977

Forest Insect and Disease Management
State and Private Forestry
Southwestern Region, Forest Service, USDA
517 Gold Avenue, SW
Albuquerque, New Mexico 87102

Prepared by:


JAMES W. WALTERS, Plant Pathologist
Forest Insect and Disease Management
BRIAN W. GEILS, Biological Technician
Forest Insect and Disease Management

APPROVED BY:


DONALD P. GRAHAM, Director
Forest Insect and Disease Management
THOMAS G. SCHNECKPEPER
Deputy Regional Forester
State and Private Forestry

INTRODUCTION

Southwestern dwarf mistletoe (Arceuthobium vaginatum subsp. cryptopodum) is the most destructive forest disease in the Southwest. This disease causes growth loss, mortality, deformity, and reduced seed production in infected trees. Timber volume yield is reduced proportionate to the level of mistletoe infestation in a stand. Volume loss in an infested stand may be 10 to 40 percent or more over a rotation. Silvicultural control of dwarf mistletoe is the most efficient method of reducing adverse effects caused by this disease. Removal of mistletoe-infected trees during precommercial and commercial thinning operations is an efficient way to suppress a dwarf mistletoe infestation.

Timber volume loss resulting from a dwarf mistletoe infestation is difficult to assess by direct observation. The effectiveness of silvicultural treatments that reduce mistletoe levels is variable. Researchers have developed a simulated yield program (SWYLD2) that will aid land managers in assessing these problems (Myers, Edminster, and Hawksworth 1976). The SWYLD2 program is designed for use in even-aged or two-storied stands of ponderosa pine. Stands may be either dwarf mistletoe-infested or non-infested. Yield tables generated by the SWYLD2 program help the land manager evaluate management alternatives through examination of simulated yields produced under selected options.

The SWYLD2 program is being evaluated for implementation in the Southwestern Region. Areas were selected in various parts of the Region for development of simulated yield tables for mistletoe-infested stands. The program for implementation of SWYLD2 consists of three phases: I. Development of yield tables for selected stands infested with dwarf mistletoe, II. Evaluation of these stands managed with the aid of SWYLD2 simulations, and III. Implementation of SWYLD2 as a tool in developing timber management programs in mistletoe-infested stands in Region 3. This report is one of a series to be issued during the implementation process.

OBJECTIVE

The purpose of this project was to develop simulated yield tables for two-storied, dwarf mistletoe-infested ponderosa pine stands on Quemado and Silver City Ranger Districts, Gila National Forest. This report summarizes additional work in Phase I of the SWYLD2 implementation program on Silver City Ranger District (see Biological Evaluation R-3 76-16 for previous work) and initial work in Phase I on Quemado Ranger District.

PROCEDURE

The following procedure constituted Phase I for this project:

1. Collect data necessary for input in the SWYLD2 program from a two-storied, dwarf mistletoe-infested ponderosa pine stand.
2. Combine data with various management alternatives selected by the land manager and produce simulated yield tables for the sampled area.
3. Assist the land manager in interpreting yield tables and selecting the best combination of management alternatives in a dwarf mistletoe-infested stand.
4. Assist the land manager in planning implementation of selected management alternatives.

METHODS

Four areas of two-storied ponderosa pine infested with dwarf mistletoe were sampled by personnel from the Forest Insect and Disease Management Staff Unit. One area was located on Quemado Ranger District and the remaining three were on Silver City Ranger District.

Sampling Procedure

1. A road log was made from the Ranger District to the survey area.
2. A map of the area was obtained and the boundary marked where necessary.
3. Age (at d.b.h.) and height measurements were taken on 10 to 20 codominant or dominant ponderosa pine trees in each of the two stories. Number of trees sampled varied with size of the sample area.
4. Age and height measurements were taken on 6 dominant ponderosa pines for determination of site index in each area.
5. Sample points were located on an 8-chain grid pattern throughout the area; a .01-acre circular plot was established at each sample point; presence or absence of dwarf mistletoe and d.b.h. were recorded for all live trees 4.5 feet or more in height and less than 6 inches d.b.h.; at the same sample point, a 20 BAF variable-size plot was established; the same variables as in the fixed plot were recorded for live trees 6 inches or greater d.b.h.; in addition, all trees marked for cut in an upcoming timber sale were noted in the survey area on Quemado Ranger District; data were recorded on automatic data processing forms.

6. Survey data were processed through the NSEC/VI computer program, which summarized field data and provided per-acre estimates of number of trees, basal area, and percent trees infected with dwarf mistletoe by 1-inch diameter classes. Site index, mean d.b.h. of the tree of average basal area, average age, and average height were also calculated from the data. Information on trees marked for cut was summarized. The summarized data were combined with management alternatives obtained from land managers and then processed through the simulated yield program SWYLD2.

RESULTS AND DISCUSSION

Quemado Ranger District

A 2,490-acre area of two-storied ponderosa pine was sampled by collecting data on 389 plots. Due to variation in stand conditions, the area was divided into three sections (Sections 2, 3, & 4). Location of the survey area is indicated in Figure 1. Line, plot, and dwarf mistletoe distribution for each section are provided in Figure 2. Plots with dwarf mistletoe had a minimum of one infected sample tree. Dwarf mistletoe was most abundant in Section 3.

Survey Results Summary

<u>Section 2</u>	<u>Overstory*</u>	<u>Understory**</u>
Site index	79	79
Average age (years)	100	40
Average height (feet)	66	32
- Number trees/acre	19	276
Basal area/acre	29	42
- Average d.b.h. (inches)	16.9	5.3
- Percent trees infected with dwarf mistletoe	4	1
 <u>Section 3</u>		
Site index	73	73
Average age (years)	140	50
Average height (feet)	69	29
- Number trees/acre	26	554
Basal area/acre	40	32
- Average d.b.h. (inches)	16.9	3.2
- Percent trees infected with dwarf mistletoe	27	22

* Overstory = all live trees $\geq$ 12.0 inches d.b.h.

** Understory = all live trees $\geq$ 4.5 feet tall and $<$ 12.0 inches d.b.h.

<u>Section 4</u>	<u>Overstory*</u>	<u>Understory**</u>
Site index	69	69
Average age (years)	120	50
Average height (feet)	74	30
— Number trees/acre	<u>22</u>	1,051
Basal area/acre	37	49
— Average d.b.h. (inches)	<u>17.4</u>	2.9
— Percent trees infected with dwarf mistletoe	<u>10</u>	5

This basic stand information was combined with management alternatives selected by Ranger District personnel to produce 8 sets (set = 1 overstory and 1 understory printout) of simulated yield tables for Section 2, 4 sets for Section 3, and 8 sets for Section 4. The yield tables were discussed and evaluated with personnel from Quemado Ranger District. Yield tables from all three sections were selected for use as examples in this report.

Because overstory management alternatives were held constant in each section, only one overstory simulation is presented for each of the three sections (Tables 1, 4, & 6). About one-fourth of the overstory basal area in Section 2 will be removed at the present time, with the remainder being carried for 20 years to final removal (Table 1). In Sections 2 and 3 (Tables 4 & 6), a regeneration cut is simulated at the present time, with the final removal in 10 years. Based on the sample of trees actually marked for cut in the upcoming timber sale, the stand DMR for each section will not change after the cut. Thus, the buildup of dwarf mistletoe in the period before final removal will be somewhat greater than that simulated in Tables 1, 4, and 6. Spread of dwarf mistletoe from infected residual overstory trees to understory is simulated for the period before final overstory removal (Tables 1-8). The SWYLD2 program converts percent trees infected with dwarf mistletoe to a stand DMR, based on the 6-class rating system. Stand DMR reflects the average mistletoe rating for all trees in a sampled area.

All understory simulations were made for a 100-year period. The regeneration scheme was constant, with a 3-cut shelterwood method being used. Various growing stock level (GSL) combinations were simulated for the initial thinning and all subsequent intermediate cuts in all three sections (Tables 2, 3, 5, 7, & 8). All thinnings were made from below, emphasizing removal of smaller than average diameter trees. A 10- and 20-year delay before the initial stand

* Overstory = all live trees $\geq$ 12.0 inches d.b.h.

** Understory = all live trees $\geq$ 4.5 feet tall and $<$ 12.0 inches d.b.h.

entry was simulated for Section 2 (Tables 2 & 3). A 20-year cutting cycle was simulated for all sections. Also, a 30-year cutting cycle was tested in Sections 3 and 4 (Tables 5, 7, & 8).

In Section 2, a 10- or 20-year delay before the initial stand entry resulted in a buildup of dwarf mistletoe which could not be controlled by subsequent stand entries (Tables 2 & 3). The difference in total board-foot volume per acre (2,500 bd. ft.) in Table 2 vs. 3 resulted from altering the initial GSL and delaying initial stand entry, which allowed dwarf mistletoe to build up. Dwarf mistletoe must be controlled in each stand entry to obtain maximum volume production in an infested stand.

Dwarf mistletoe was under control in all simulations for Sections 3 and 4 (Tables 5, 7, & 8). Tables 7 and 8, for Section 4, simulate the same management alternatives, except the cutting cycle option. Twenty- and 30-year cutting cycles were tested to determine the effects on total volume production over the rotation. The 20-year cycle (Table 8) resulted in slightly higher (600 bd. ft.) volume production than did the 30-year cycle (Table 7). Simulated yield tables generated by the SWYLD2 program will aid land managers in selecting a combination of management alternatives that best meet current management objectives.

Silver City Ranger District

Three stands of two-storied ponderosa pine were sampled on Silver City Ranger District. Data were collected on 25 plots, representing 160 acres, in Stand 1; 30 plots, representing 192 acres, in Stand 2; and 19 plots, representing 122 acres, in Stand 3. Location of the survey areas is indicated in Figure 3. Line, plot, and dwarf mistletoe distribution for each stand are provided in Figures 4, 5, and 6. Plots with dwarf mistletoe had a minimum of one infected sample tree. Dwarf mistletoe was not widely distributed in Stands 1 and 2; however, Stand 3 had mistletoe scattered throughout the area.

Survey Results Summary

<u>Stand 1</u>	<u>Overstory*</u>	<u>Understory**</u>
Site index	67	67
Average age (years)	100	60
Average height (feet)	62	41
Number trees/acre	17	707
Basal area/acre	21	96
Average d.b.h. (inches)	15.0	5.0
Percent trees infected with dwarf mistletoe	8	6

* Overstory = all live trees $\geq$ 12.0 inches d.b.h.

** Understory = all live trees $\geq$ 4.5 feet tall and $<$ 12.0 inches d.b.h.

<u>Stand 2</u>	<u>Overstory*</u>	<u>Understory**</u>
Site index	72	72
Average age (years)	100	50
Average height (feet)	61	38
Number trees/acre	30	252
Basal area/acre	46	41
Average d.b.h. (inches)	16.2	5.5
Percent trees infected with dwarf mistletoe	6	18
 <u>Stand 3</u>		
Site index	82	82
Average age (years)	110	60
Average height (feet)	70	41
Number trees/acre	47	178
Basal area/acre	60	41
Average d.b.h. (inches)	15.3	6.5
Percent trees infected with dwarf mistletoe	38	24

This basic stand information was combined with management alternatives selected by Ranger District personnel to produce 12 sets of yield tables for Stand 1, 4 sets for Stand 2, and 8 sets for Stand 3. The yield tables were discussed and evaluated with personnel from Silver City Ranger District. Four yield tables from Stand 1 were selected for use as examples in this report.

Overstory management alternatives were held constant; thus, only one simulation is presented (Table 9). Growth for the overstory was simulated for 20 years before final removal. At biological age 120, all overstory trees will be cut. Dwarf mistletoe increased from a DMR of .2 at present to a DMR of .5 in 20 years. The SWYLD2 program converts percent trees infected with dwarf mistletoe to a stand DMR, based on the 6-class rating system. Stand DMR reflects the average mistletoe rating for all trees in a sampled area. Spread of dwarf mistletoe from overstory to understory is simulated for the 20-year period before final overstory removal (Tables 9-12).

All understory simulations were made to biological rotation age 140. The regeneration scheme was constant, with a 3-cut shelterwood method being used. Regeneration cuts were made at age 100, 120, and 140. The

* Overstory = all live trees $\geq$ 12.0 inches d.b.h.

** Understory = all live trees $\geq$ 4.5 feet tall and $<$ 12.0 inches d.b.h.

initial thinning and all subsequent intermediate cuts were made from below. A 20-year cutting cycle was simulated for all understory simulations. Various growing stock level (GSL) combinations were simulated for the initial thinning and all subsequent intermediate cuts (Tables 10, 11, & 12).

Dwarf mistletoe was controlled in all simulations. Variation in total board-foot yields per acre resulted from altering the GSL for subsequent intermediate cuts (Tables 10, 11, & 12). Simulating a subsequent GSL of 80, rather than 100, resulted in a difference in total board-foot volume of 1,300 board feet (Table 10 vs. 12). Simulated yield tables generated by the SWYLD2 program will aid land managers in selecting the combination of management alternatives that best meet current management objectives.

CONCLUSIONS AND RECOMMENDATIONS

Sufficient stand data were obtained on Quemado and Silver City Ranger Districts for use in the simulated yield program SWYLD2. The data were combined with various management alternatives selected by Ranger District personnel, and yield tables were produced for sampled areas. Examination of yield tables by the land manager and personnel from Forest Insect and Disease Management revealed two important factors: (1) the success of dwarf mistletoe control is dependent on management alternatives selected for use in a particular area; (2) total volume production per acre is dependent on management alternatives, particularly initial and subsequent GSL's, selected for use in a particular area.

The simulated yield program is a useful tool for land managers. The limits of the program will be revealed after on-the-ground situations, in which simulated yield information has been applied, are compared with post-treatment simulated yields. Based on results in this report, the following plan of action is recommended for the areas sampled on Quemado and Silver City Ranger Districts:

1. Select the yield table and accompanying management alternatives that best meet current management objectives, while reducing dwarf mistletoe to acceptable levels (FSM 5260).
2. Implement management alternatives selected for the first stand entry in the overstory and understory.
3. With the assistance of personnel from the Forest Insect and Disease Management Staff Unit, complete a post-treatment evaluation of the area.
4. Compare results of the post-treatment evaluation with simulated yield predictions (Phase II).

The growing stock levels used to generate yield tables for stands considered in this report are not intended as "best" growing stock levels for widespread use; however, they demonstrate the need for case-by-case selection of a suitable level based on the manager's objectives in conjunction with mistletoe management.

Instructions for use of the SWYLD2 program and detailed descriptions of management alternatives are provided by Edminster and Hawksworth (1976). Additional information on the SWYLD2 program, relative to dwarf mistletoe management, may be obtained by contacting Forest Insect and Disease Management. For general information on the SWYLD2 program, contact Forest Insect and Disease Management or Timber Management.

LITERATURE CITED

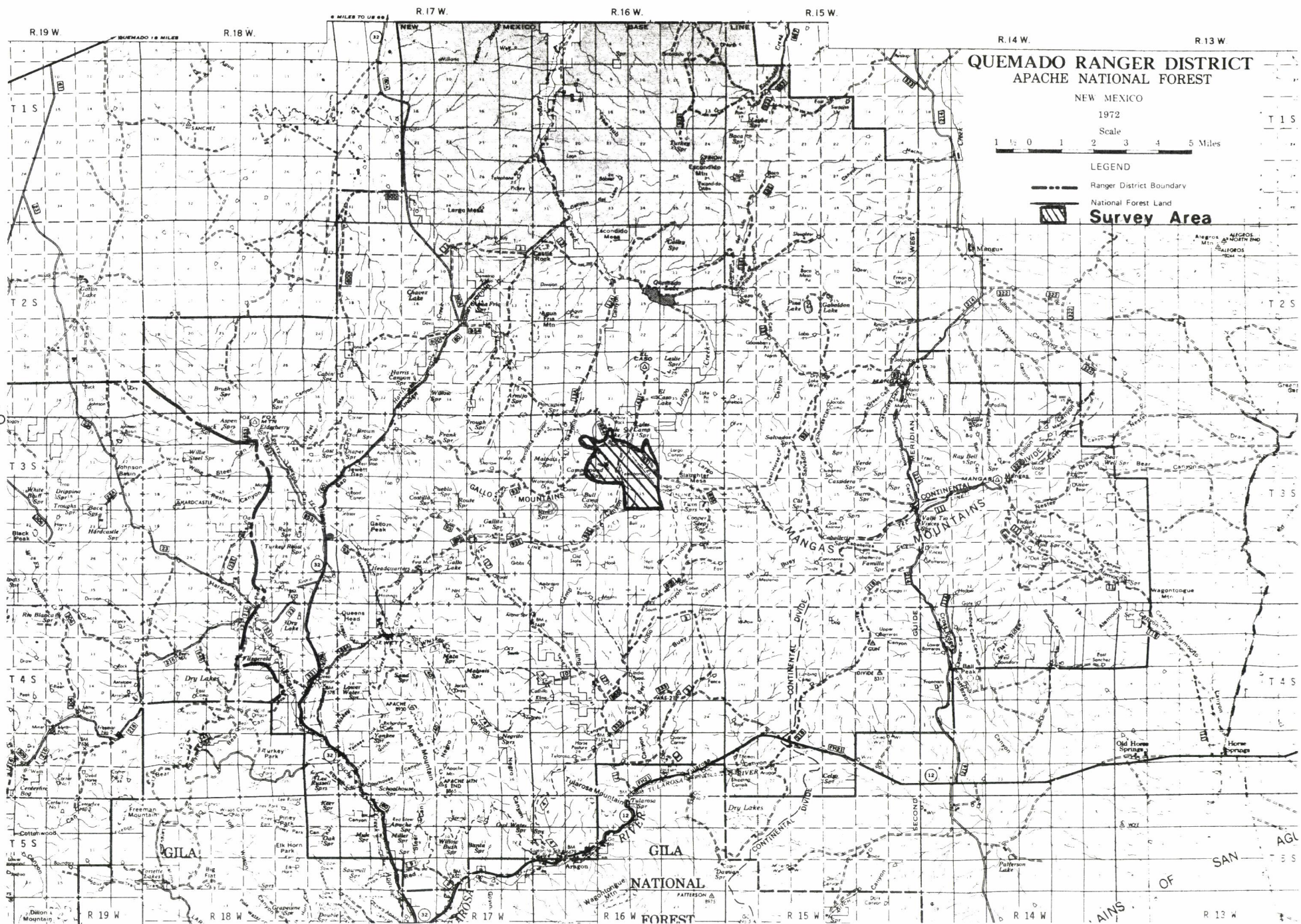
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- Walters, J. W., and B. W. Geils. 1976. Biological evaluation, southwestern dwarf mistletoe. R-3 76-16. 5 pp.

32-93 at mile 95.5

Rim Spg at 105.4

Sammill at 108.3

Q. caso at 107.8



planned
El. Case
Call

Tom Rott

Brian Ferguson

-10-

Section 2: 442 acres
69 plots
Section 3: 1,357 acres
212 plots
Section 4: 691 acres
108 plots
Total: 2,490 acres
389 plots

Scale: .5 cm = 8 chains

Sandston cut, only
cutting on unit - sold plot made

LEGEND	
●	Plots with no dwarf mistletoe
✕	Plots with dwarf mistletoe
▨	Non-type area
----	Section boundary
-.-.-	Survey area boundary
—	Forest road

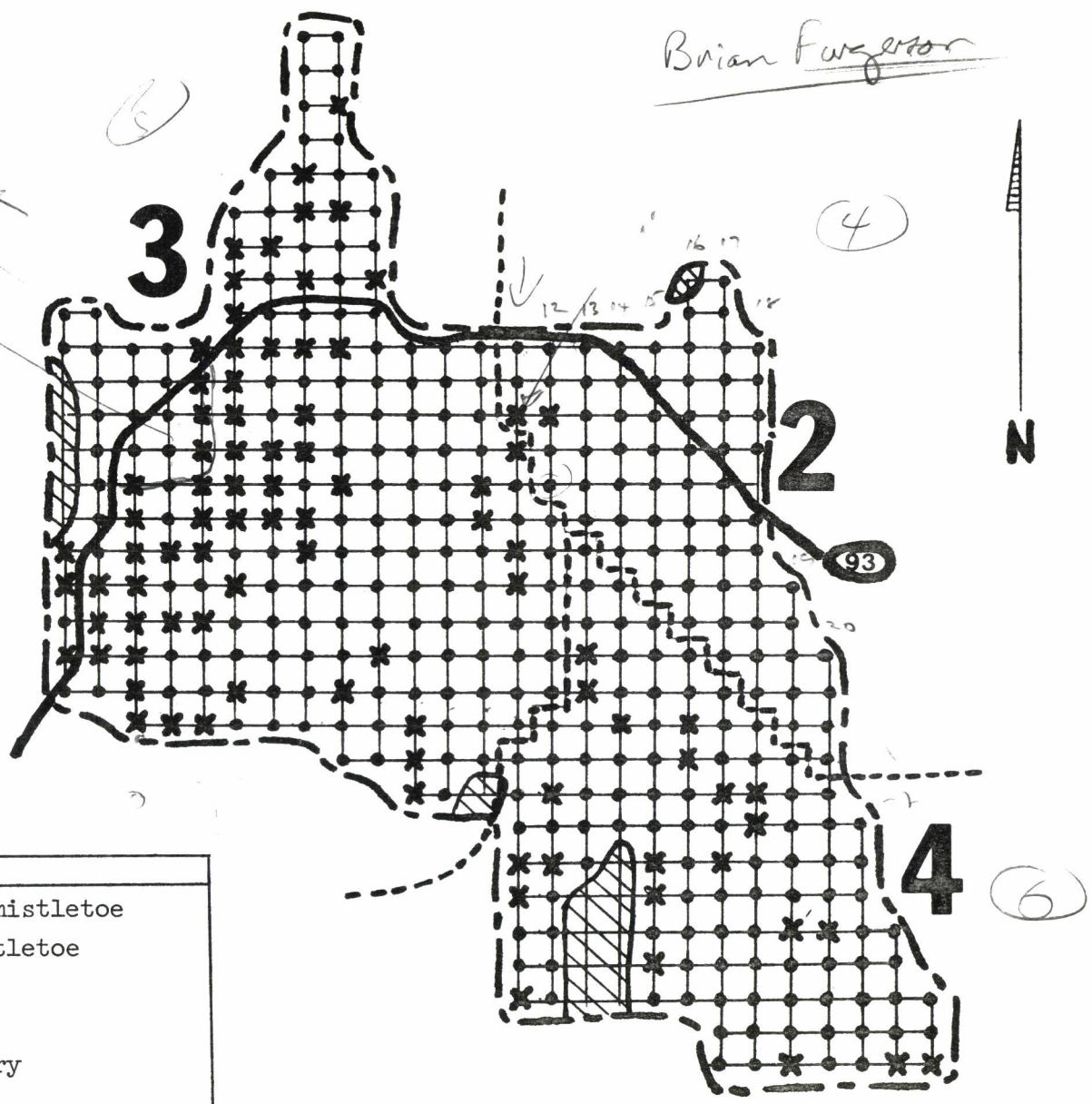
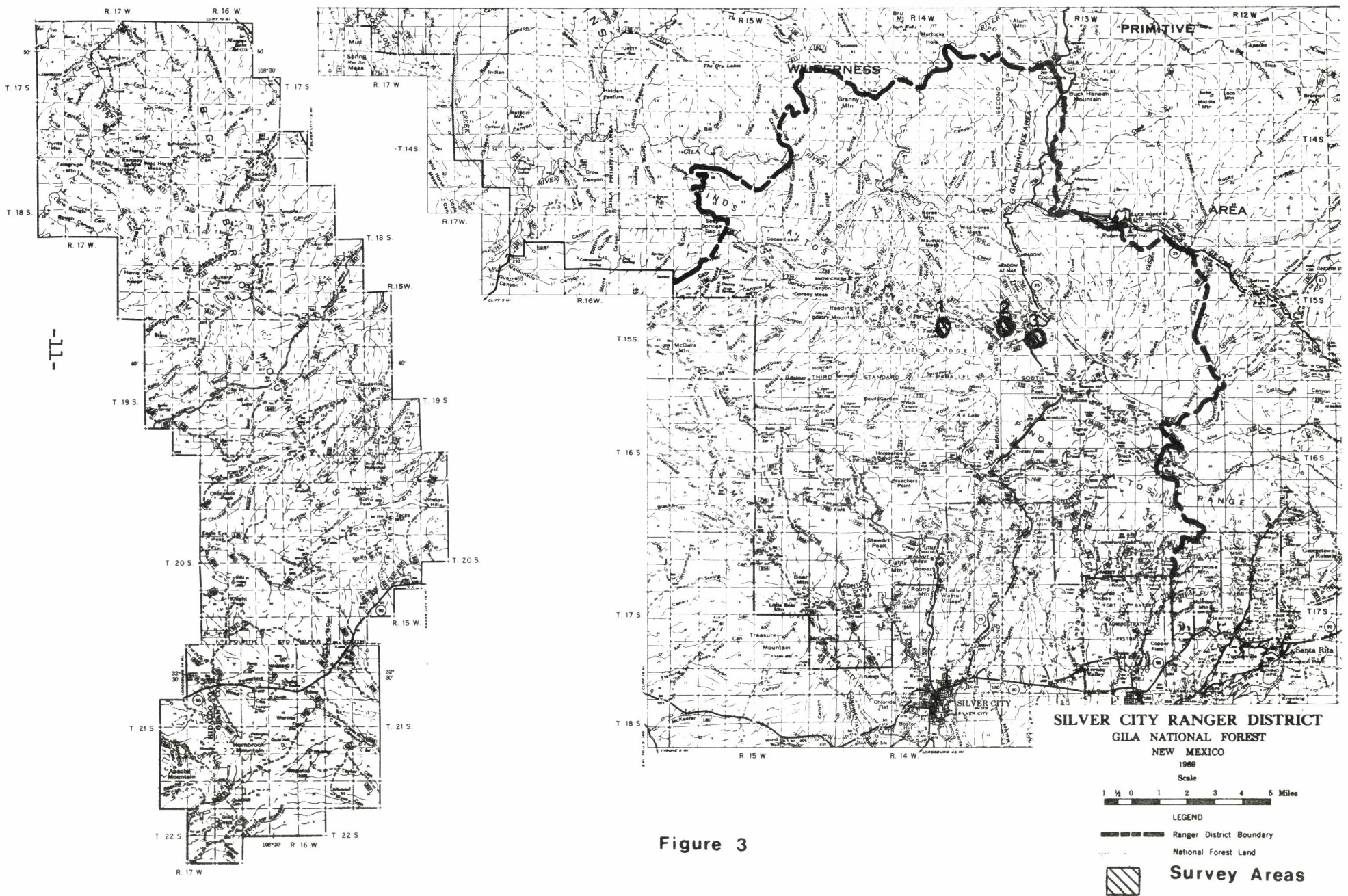
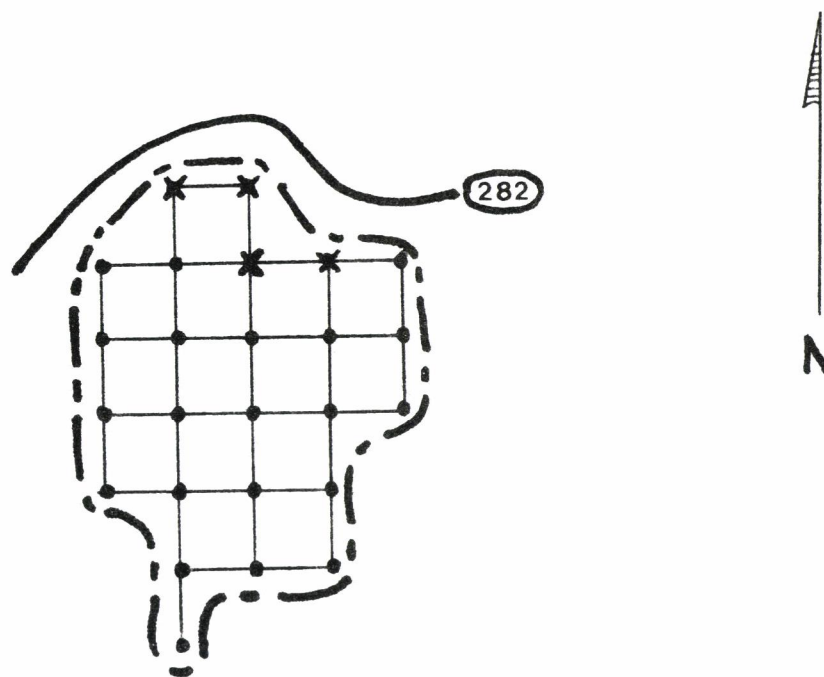


Fig. 2.--Line and plot distribution with an indication of dwarf mistletoe presence or absence; Quemado Ranger District; T3S, R16W, Sec. 3, 4, 5, 8, 9, 10, 15, & 16.



160 acres
25 plots

Scale: 1 cm = 8 chains



LEGEND	
•	Plots with no dwarf mistletoe
X	Plots with dwarf mistletoe
- - -	Survey area boundary
—	Forest road

Fig. 4.--Stand 1; line and plot distribution with an indication of dwarf mistletoe presence or absence; Silver City Ranger District; T15S, R14W, Sec. 22, 23, 26, & 27.

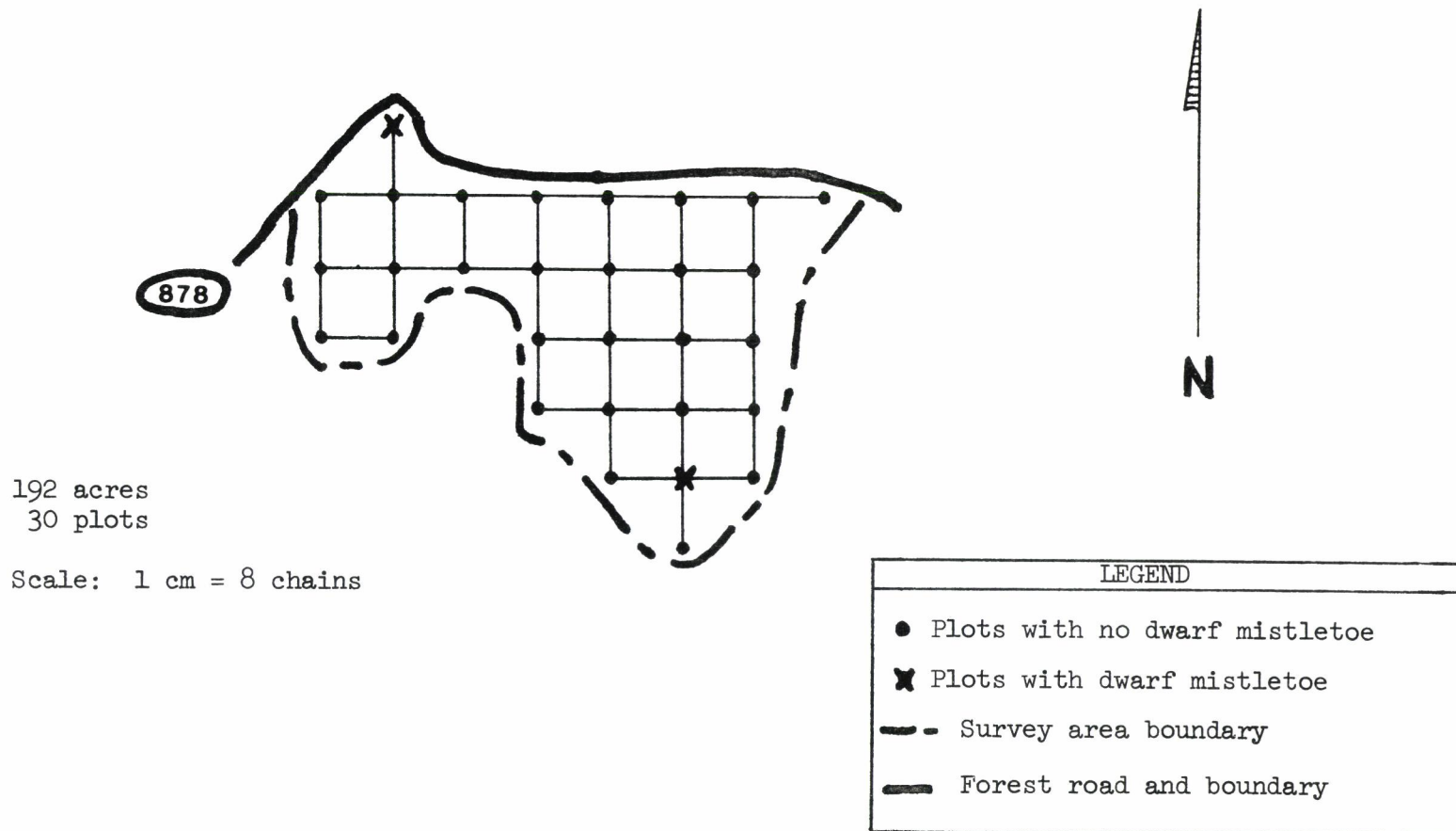


Fig. 5.--Stand 2; line and plot distribution with an indication of dwarf mistletoe presence or absence; Silver City Ranger District; T15S, R13W, Sec. 24, R14W, Sec. 19 & 30.

122 acres
19 plots

Scale: 1 cm = 8 chains

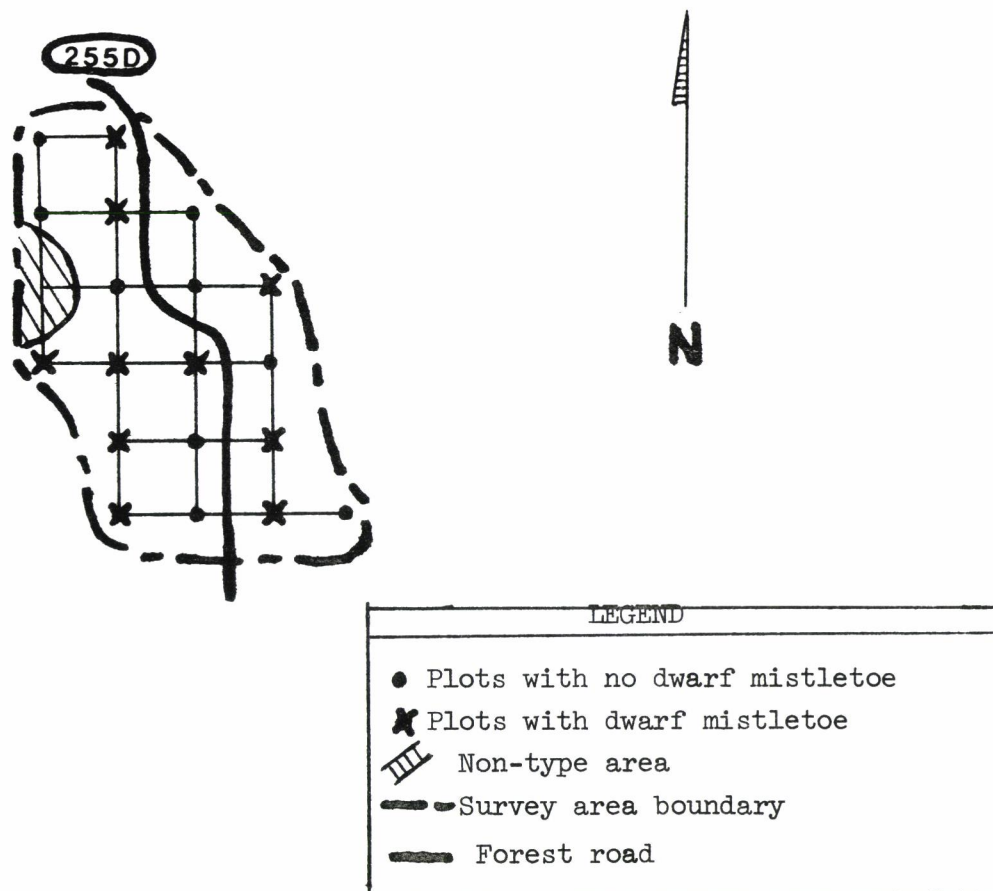


Fig. 6.--Stand 3; line and plot distribution with an indication of dwarf mistletoe presence or absence; Silver City Ranger District; T15S, R13W, Sec. 29.

YIELDS PER ACRE OF SOUTHWESTERN PONDEROSA PINE, STAND NUMBER 92., OVERSTORY.

SITE INDEX 79

THINNING INTENSITY-- INITIAL- 100, SUBSEQUENT- 29.

STND 92 CAMPGROUND QUEMADO 76

CHARACTERISTICS BEFORE AND AFTER THINNING

PERIODIC INTERMEDIATE CUTS

STAND AGE (YEARS)	DMR	TREES NO.	BASAL AREA SQ.FT.	AVERAGE D.B.H. IN.	AVERAGE HEIGHT FT.	TOTAL VOLUME CU.FT.	MERCHANT- ABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.	TREES NO.	BASAL AREA SQ.FT.	TOTAL VOLUME CU.FT.	MERCHANT- ABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.
100	.1	19	30	16.9	66	740	700	3200					
100	.0+	15	21	16.2	64	520	490	2200	4	9	220	210	1000
110	.1	15	25	17.6	68	650	630	2900					
120	.1	15	29	18.8	71	780	760	3700					
TOTAL YIELDS											1000	970	4700

MERCH. CU. FT. - TREES 6.0 INCHES D.B.H. AND LARGER TO 4.0-INCH TOP.

BD. FT. - TREES 10.0 INCHES D.B.H. AND LARGER TO VARIABLE TOP LIMIT.

INITIAL THINNING FROM ABOVE ALLOWED IN STANDS WITH DWARF MISTLETOE.

DWARF MISTLETOE RATING ABOVE WHICH PERIODIC THINNINGS WILL NOT BE EXECUTED - 3.0.

MINIMUM CUTS FOR INCLUSION IN TOTAL YIELDS-- 1. CUBIC FEET AND 1. BOARD FEET.

ALL THINNINGS MAY BE NONCOMMERCIAL.

AT INITIAL AGE 100., 4. PERCENT OF THE TREES WERE INFECTED WITH DWARF MISTLETOE.

YIELDS PER ACRE OF SOUTHWESTERN PONDEROSA PINE, STAND NUMBER 92., UNDERSTORY.

SITE INDEX 79

THINNING INTENSITY-- INITIAL- 80. SUBSEQUENT- 80.

SIND 92 CAMPGROUND QUEMADO 76

CHARACTERISTICS BEFORE AND AFTER THINNING

PERIODIC INTERMEDIATE CUTS

STAND AGE (YEARS)	DMR	TREES NO.	BASAL AREA SQ.FT.	AVERAGE D.B.H. IN.	AVERAGE HEIGHT FT.	TOTAL VOLUME CU.FT.	MERCHANT- ABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.	TREES NO.	BASAL AREA SQ.FT.	TOTAL VOLUME CU.FT.	MERCHANT- ABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.
40	.1	276	42	5.3	32	600	190	0					
50	.5	274	65	6.6	42	1050	680	0					
50	.3	257	63	6.7	42	1020	670	0	17	2	30	10	0
60	.7	254	84	7.8	49	1510	1200	0					
70	1.1	252	109	8.9	57	2180	1880	2100					
70	.6	169	78	9.2	58	1570	1370	1800	83	31	610	510	300
80	1.0	168	99	10.4	64	2300	2080	5100					
90	1.4	168	119	11.4	69	3040	2790	9800					
90	.8	105	80	11.8	70	2060	1890	6700	63	39	980	900	3100
100	1.2	105	97	13.0	74	2690	2500	9400					
100	.5	52	56	14.0	75	1570	1470	5800	53	41	1120	1030	3600
110	.8	52	67	15.4	79	2010	1910	8100					
120	1.2	52	79	16.7	83	2480	2370	10600					
120	.2	15	28	18.6	85	910	880	4200	37	51	1570	1490	6400
130	.6	15	35	20.6	88	1160	1130	5900					
140	1.0	15	41	22.4	90	1420	1380	7700					
TOTAL YIELDS											5730	5320	21100

MERCH. CU. FT. - TREES 6.0 INCHES D.B.H. AND LARGER TO 4.0-INCH TOP.

BD. FT. - TREES 10.0 INCHES D.B.H. AND LARGER TO VARIABLE TOP LIMIT.

INITIAL THINNING MUST BE FROM BELOW.

DWARF MISTLETOE RATING ABOVE WHICH PERIODIC THINNINGS WILL NOT BE EXECUTED - 3.0.

MINIMUM CUTS FOR INCLUSION IN TOTAL YIELDS-- 1. CUBIC FEET AND 1. BOARD FEET.

ALL THINNINGS MAY BE NONCOMMERCIAL.

AT INITIAL AGE 40., 1. PERCENT OF THE TREES WERE INFECTED WITH DWARF MISTLETOE.

Table 2

YIELDS PER ACRE OF SOUTHWESTERN PONDEROSA PINE, STAND NUMBER 92., UNDERSTORY.

SITE INDEX 79

THINNING INTENSITY-- INITIAL- 70, SUBSEQUENT- 80.

STND 92 CAMPGROUND QUEMADO 76

CHARACTERISTICS BEFORE AND AFTER THINNING

PERIODIC INTERMEDIATE CUTS

STAND AGE (YEARS)	DMR	TREES NO.	BASAL AREA SQ.FT.	AVERAGE D.B.H. IN.	AVERAGE HEIGHT FT.	TOTAL VOLUME CU.FT.	MERCHANT-ABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.	TREES NO.	BASAL AREA SQ.FT.	TOTAL VOLUME CU.FT.	MERCHANT-ABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.
40	.1	276	42	5.3	32	600	190	0					
50	.5	274	65	6.6	42	1050	680	0					
60	.9	271	85	7.6	49	1540	1190	0					
60	.4	185	63	7.9	50	1140	910	0	86	22	400	280	0
70	.8	184	85	9.2	57	1700	1490	1900					
80	1.3	183	106	10.3	64	2450	2210	5200					
80	.8	131	80	10.6	64	1880	1700	4400	52	26	570	510	800
90	1.2	131	99	11.8	69	2560	2360	8400					
100	2.0	124	111	12.8	74	3070	2850	10600					
100	1.1	51	56	14.2	75	1590	1490	6000	73	55	1480	1360	4600
110	1.8	49	65	15.6	79	1950	1850	7900					
120	2.5	46	73	17.0	83	2270	2180	9800					
120	1.5	15	29	18.7	84	920	890	4300	31	44	1350	1290	5500
130	2.3	15	35	20.6	87	1160	1120	5900					
140	3.1	15	41	22.4	90	1410	1380	7700					
TOTAL YIELDS											5210	4820	18600

MERCH. CU. FT. - TREES 6.0 INCHES D.B.H. AND LARGER TO 4.0-INCH TOP.

BD. FT. - TREES 10.0 INCHES D.B.H. AND LARGER TO VARIABLE TOP LIMIT.

INITIAL THINNING MUST BE FROM BELOW.

DWARF MISTLETOE RATING ABOVE WHICH PERIODIC THINNINGS WILL NOT BE EXECUTED - 3.0.

MINIMUM CUTS FOR INCLUSION IN TOTAL YIELDS-- 1. CUBIC FEET AND 1. BOARD FEET.

ALL THINNINGS MAY BE NONCOMMERCIAL.

AT INITIAL AGE 40., 1. PERCENT OF THE TREES WERE INFECTED WITH DWARF MISTLETOE.

Table 3

YIELDS PER ACRE OF SOUTHWESTERN PONDEROSA PINE, STAND NUMBER 93,, OVERSTORY.

SITE INDEX 73

THINNING INTENSITY-- INITIAL= 100. SUBSEQUENT= 40.

STND 93 CAMPGROUND QUEMADO 76

CHARACTERISTICS BEFORE AND AFTER THINNING

PERIODIC INTERMEDIATE CUTS

STAND AGE (YEARS)	DMR	TREES NO.	BASAL AREA SQ.FT.	AVERAGE D.B.H. IN.	AVERAGE HEIGHT FT.	TOTAL VOLUME CU.FT.	MERCHANT- ABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.	TREES NO.	BASAL AREA SQ.FT.	TOTAL VOLUME CU.FT.	MERCHANT- ABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.
140	.3	26	41	16.9	69	1060	1010	4500					
140	.0+	23	34	16.4	68	860	820	3600	3	7	200	190	900
150	.1	23	40	17.8	70	1050	1010	4700					
TOTAL YIELDS											1250	1200	5600

MERCH. CU. FT. - TREES 6.0 INCHES D.B.H. AND LARGER TO 4.0-INCH TOP.
 BD. FT. - TREES 10.0 INCHES D.B.H. AND LARGER TO VARIABLE TOP LIMIT.
 INITIAL THINNING FROM ABOVE ALLOWED IN STANDS WITH DWARF MISTLETOE.
 DWARF MISTLETOE RATING ABOVE WHICH PERIODIC THINNINGS WILL NOT BE EXECUTED - 3.0.
 MINIMUM CUTS FOR INCLUSION IN TOTAL YIELDS-- 1. CUBIC FEET AND 1. BOARD FEET.
 ALL THINNINGS MAY BE NONCOMMERCIAL.
 AT INITIAL AGE 140,, 27. PERCENT OF THE TREES WERE INFECTED WITH DWARF MISTLETOE.

Table 4

YIELDS PER ACRE OF SOUTHWESTERN PONDEROSA PINE, STAND NUMBER 93., UNDERSTORY.

SITE INDEX 73
THINNING INTENSITY-- INITIAL- 70, SUBSEQUENT- 80.

STND 93 CAMPGROUND QUEMADO 76

CHARACTERISTICS BEFORE AND AFTER THINNING

PERIODIC INTERMEDIATE CUTS

STAND AGE (YEARS)	DMR	TREES NO.	BASAL AREA SQ.FT.	AVERAGE D.B.H. IN.	AVERAGE HEIGHT FT.	TOTAL VOLUME CU.FT.	MERCHANT-ABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.	TREES NO.	BASAL AREA SQ.FT.	TOTAL VOLUME CU.FT.	MERCHANT-ABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.
50	.3	554	31	3.2	29	590	0	0					
50	.0+	386	26	3.5	29	460	0	0	168	5	130	0	0
60	.1	382	48	4.8	38	800	0	0					
70	.2	380	80	6.2	45	1380	760	0					
70	.0+	266	61	6.5	45	1060	660	0	114	19	320	100	0
80	.1	264	85	7.7	51	1580	1240	0					
90	.1	262	108	8.7	56	2140	1820	1700					
90	.0+	172	78	9.1	57	1540	1340	1600	90	30	600	480	100
100	.1	171	97	10.2	61	2140	1930	4300					
110	.1	171	117	11.2	65	2790	2550	8400					
110	.0+	65	56	12.6	66	1380	1280	4700	106	61	1410	1270	3700
120	.1	65	69	14.0	70	1810	1700	6700					
130	.1	65	82	15.2	72	2230	2110	8800					
130	.0+	18	29	17.1	74	810	770	3500	47	53	1420	1340	5300
140	.1	18	35	19.0	77	1040	1000	4900					
150	.1	18	42	20.7	79	1270	1230	6500					
TOTAL YIELDS											5150	4420	15600

MERCH. CU. FT. - TREES 6.0 INCHES D.B.H. AND LARGER TO 4.0-INCH TOP.

BD. FT. - TREES 10.0 INCHES D.B.H. AND LARGER TO VARIABLE TOP LIMIT.

INITIAL THINNING MUST BE FROM BELOW.

DWARF MISTLETOE RATING ABOVE WHICH PERIODIC THINNINGS WILL NOT BE EXECUTED - 3.0.

MINIMUM CUTS FOR INCLUSION IN TOTAL YIELDS-- 1. CUBIC FEET AND 1. BOARD FEET.

ALL THINNINGS MAY BE NONCOMMERCIAL.

AT INITIAL AGE 50., 22. PERCENT OF THE TREES WERE INFECTED WITH DWARF MISTLETOE.

Table 5

YIELDS PER ACRE OF SOUTHWESTERN PONDEROSA PINE, STAND NUMBER 94., OVERSTORY.

SITE INDEX 69

THINNING INTENSITY-- INITIAL- 100. SUBSEQUENT- 37.

STND 94 CAMPGROUND GUENADO 76

CHARACTERISTICS BEFORE AND AFTER THINNING

PERIODIC INTERMEDIATE CUTS

STAND AGE (YEARS)	DMR	TREES NO.	BASAL AREA SQ.FT.	AVERAGE D.B.H. IN.	AVERAGE HEIGHT FT.	TOTAL VOLUME CU.FT.	MERCHANT- ABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.	TREES NO.	BASAL AREA SQ.FT.	TOTAL VOLUME CU.FT.	MERCHANT- ABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.
120	.2	22	36	17.4	74	1020	980	4500					
120	.0+	17	26	16.6	73	700	670	3000	5	10	320	310	1500
130	.1	17	30	18.1	75	870	830	3900					
TOTAL YIELDS											1190	1140	5400

MERCH. CU. FT. - TREES 6.0 INCHES D.B.H. AND LARGER TO 4.0-INCH TOP.

BD. FT. - TREES 10.0 INCHES D.B.H. AND LARGER TO VARIABLE TOP LIMIT.

INITIAL THINNING FROM ABOVE ALLOWED IN STANDS WITH DWARF MISTLETOE.

DWARF MISTLETOE RATING ABOVE WHICH PERIODIC THINNINGS WILL NOT BE EXECUTED - 3.0.

MINIMUM CUTS FOR INCLUSION IN TOTAL YIELDS-- 1. CUBIC FEET AND 1. BOARD FEET.

ALL THINNINGS MAY BE NONCOMMERCIAL.

AT INITIAL AGE 120., 10. PERCENT OF THE TREES WERE INFECTED WITH DWARF MISTLETOE.

Table 6

YIELDS PER ACRE OF SOUTHWESTERN PONDEROSA PINE, STAND NUMBER 94., UNDERSTORY.

SITE INDEX 69

THINNING INTENSITY-- INITIAL- 70. SUBSEQUENT- 80.

STND 94 CAMPGROUND QUEMADO 76

CHARACTERISTICS BEFORE AND AFTER THINNING

PERIODIC INTERMEDIATE CUTS

STAND AGE (YEARS)	DMR	TREES NO.	BASAL AREA SQ.FT.	AVERAGE D.B.H. IN.	AVERAGE HEIGHT FT.	TOTAL VOLUME CU.FT.	MERCHANT- ABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.	TREES NO.	BASAL AREA SQ.FT.	TOTAL VOLUME CU.FT.	MERCHANT- ABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.
50	.1	1051	48	2.9	30	1060	0	0					
50	.0+	400	24	3.3	32	470	0	0	651	24	590	0	0
60	.1	397	46	4.6	38	790	0	0					
70	.1	395	78	6.0	45	1360	680	0					
80	.6	391	104	7.0	50	1950	1380	0					
80	.0+	229	68	7.4	51	1280	960	0	162	36	670	420	0
90	.2	228	90	8.5	56	1780	1500	1100					
100	.3	227	112	9.5	60	2420	2130	3500					
110	.7	225	130	10.3	64	3040	2740	6700					
110	.0+	73	56	11.9	66	1360	1250	4500	152	74	1680	1490	2200
120	.2	73	69	13.2	69	1780	1660	6300					
130	.3	73	83	14.4	71	2220	2090	8400					
130	.0+	19	28	16.3	74	760	730	3200	54	55	1460	1360	5200
140	.1	19	34	18.2	76	990	950	4500					
150	.2	19	41	19.9	78	1220	1180	6000					
TOTAL YIELDS											5620	4450	13400

MERCH. CU. FT. - TREES 6.0 INCHES D.B.H. AND LARGER TO 4.0-INCH TOP.

BD. FT. - TREES 10.0 INCHES D.B.H. AND LARGER TO VARIABLE TOP LIMIT.

INITIAL THINNING MUST BE FROM BELOW.

DWARF MISTLETOE RATING ABOVE WHICH PERIODIC THINNINGS WILL NOT BE EXECUTED - 3.0.

MINIMUM CUTS FOR INCLUSION IN TOTAL YIELDS-- 1. CUBIC FEET AND 1. BOARD FEET.

ALL THINNINGS MAY BE NONCOMMERCIAL.

AT INITIAL AGE 50., 4. PERCENT OF THE TREES WERE INFECTED WITH DWARF MISTLETOE.

Table 7

YIELDS PER ACRE OF SOUTHWESTERN PONDEROSA PINE, STAND NUMBER 94., UNDERSTORY.

SITE INDEX 69
THINNING INTENSITY-- INITIAL- 70. SUBSEQUENT- 80.

STND 94 CAMPGROUND QUEMADO 76

CHARACTERISTICS BEFORE AND AFTER THINNING

PERIODIC INTERMEDIATE CUTS

STAND AGE (YEARS)	DMR	TREES NU.	BASAL AREA SQ.FT.	AVERAGE D.B.H. IN.	AVERAGE HEIGHT FT.	TOTAL VOLUME CU.FT.	MERCHANT- ABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.	TREES NU.	BASAL AREA SQ.FT.	TOTAL VOLUME CU.FT.	MERCHANT- ABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.
50	.1	1051	48	2.9	30	1060	0	0					
50	.0+	400	24	3.3	32	470	0	0	651	24	590	0	0
60	.1	397	46	4.6	38	790	0	0					
70	.1	395	78	6.0	45	1360	680	0					
70	.0+	274	59	6.3	45	1040	600	0	121	19	320	80	0
80	.1	272	83	7.5	51	1550	1180	0					
90	.1	270	106	8.5	56	2100	1770	1400					
90	.0+	182	77	8.8	57	1530	1310	1200	88	29	570	460	200
100	.1	181	97	9.9	61	2110	1890	3700					
110	.1	180	115	10.8	64	2700	2450	7100					
110	.0+	69	56	12.2	66	1360	1260	4500	111	59	1340	1190	2600
120	.1	69	69	13.5	69	1760	1650	6400					
130	.1	69	81	14.7	72	2190	2070	8400					
130	.0+	19	29	16.6	74	790	760	3400	50	52	1400	1310	5000
140	.1	19	35	18.4	76	1010	980	4700					
150	.1	19	42	20.1	78	1250	1210	6200					
TOTAL YIELDS											5470	4250	14000

MERCH. CU. FT. - TREES 6.0 INCHES D.B.H. AND LARGER TO 4.0-INCH TOP.

BD. FT. - TREES 10.0 INCHES D.B.H. AND LARGER TO VARIABLE TOP LIMIT.

INITIAL THINNING MUST BE FROM BELOW.

DWARF MISTLETOE RATING ABOVE WHICH PERIODIC THINNINGS WILL NOT BE EXECUTED - 3.0.

MINIMUM CUTS FOR INCLUSION IN TOTAL YIELDS-- 1. CUBIC FEET AND 1. BOARD FEET.

ALL THINNINGS MAY BE NONCOMMERCIAL.

AT INITIAL AGE 50., 4. PERCENT OF THE TREES WERE INFECTED WITH DWARF MISTLETOE.

Table 8

YIELDS PER ACRE OF SOUTHWESTERN PONDEROSA PINE, STAND NUMBER 3., OVERSTORY.

SITE INDEX 67

THINNING INTENSITY-- INITIAL- 21. SUBSEQUENT- 21.

STND 3 SHEEP CURRAL II SILVER CITY GILA 76

CHARACTERISTICS BEFORE AND AFTER THINNING

PERIODIC INTERMEDIATE CUTS

STAND AGE (YEARS)	DMR	TREES NO.	BASAL AREA SQ.FT.	AVERAGE D.B.H. IN.	AVERAGE HEIGHT FT.	TOTAL VOLUME CU.FT.	MERCHANT- ABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.	TREES NO.	BASAL AREA SQ.FT.	TOTAL VOLUME CU.FT.	MERCHANT- ABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.
100	.2	17	21	15.0	62	480	450	1900					
110	.3	17	24	16.1	65	590	560	2400					
120	.5	17	27	17.0	68	690	660	3000					
TOTAL YIELDS											690	660	3000

MERCH. CU. FT. - TREES 6.0 INCHES D.B.H. AND LARGER TO 4.0-INCH TOP.

BD. FT. - TREES 10.0 INCHES D.B.H. AND LARGER TO VARIABLE TOP LIMIT.

INITIAL THINNING FROM ABOVE ALLOWED IN STANDS WITH DWARF MISTLETOE.

DWARF MISTLETOE RATING ABOVE WHICH PERIODIC THINNINGS WILL NOT BE EXECUTED - 3.0.

MINIMUM CUTS FOR INCLUSION IN TOTAL YIELDS-- 1. CUBIC FEET AND 1. BOARD FEET.

ALL THINNINGS MAY BE NONCOMMERCIAL.

AT INITIAL AGE 100., 9. PERCENT OF THE TREES WERE INFECTED WITH DWARF MISTLETOE.

Table 9

YIELDS PER ACRE OF SOUTHWESTERN PONDEROSA PINE, STAND NUMBER 3., UNDERSTORY.

SITE INDEX 67

THINNING INTENSITY-- INITIAL- 90. SUBSEQUENT- 80.

STND 3 SHEEP CORRAL II SILVER CITY GILA 76

CHARACTERISTICS BEFORE AND AFTER THINNING

PERIODIC INTERMEDIATE CUTS

STAND AGE (YEARS)	DMR	TREES NO.	BASAL AREA SQ.FT.	AVERAGE D.B.H. IN.	AVERAGE HEIGHT FT.	TOTAL VOLUME CU.FT.	MERCHANT- ABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.	TREES NO.	BASAL AREA SQ.FT.	TOTAL VOLUME CU.FT.	MERCHANT- ABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.
60	.1	707	96	5.0	41	1710	430	0					
60	.0+	359	57	5.4	43	1000	350	0	348	39	710	80	0
70	.1	355	79	6.4	49	1480	890	0					
80	.1	349	99	7.2	55	1970	1440	0					
80	.0+	226	69	7.5	55	1390	1060	0	123	30	580	380	0
90	.1	225	91	8.6	60	1920	1620	1300					
100	.1	224	110	9.5	64	2550	2250	3700					
100	.0+	97	56	10.3	65	1320	1190	2600	127	54	1230	1060	1100
110	.1	97	71	11.6	68	1790	1640	5800					
120	.1	97	85	12.7	71	2270	2110	7800					
120	.0+	24	28	14.6	74	770	730	3000	73	57	1500	1380	4800
130	.1	24	35	16.4	76	1010	970	4300					
140	.1	24	43	18.1	79	1280	1230	5800					
TOTAL YIELDS											5300	4130	11700

MERCH. CU. FT. - TREES 6.0 INCHES D.B.H. AND LARGER TO 4.0-INCH TOP.

BD. FT. - TREES 10.0 INCHES D.B.H. AND LARGER TO VARIABLE TOP LIMIT.

INITIAL THINNING MUST BE FROM BELOW.

DWARF MISTLETOE RATING ABOVE WHICH PERIODIC THINNINGS WILL NOT BE EXECUTED - 3.0.

MINIMUM CUTS FOR INCLUSION IN TOTAL YIELDS-- 1. CUBIC FEET AND 1. BOARD FEET.

ALL THINNINGS MAY BE NONCOMMERCIAL.

AT INITIAL AGE 60., 6. PERCENT OF THE TREES WERE INFECTED WITH DWARF MISTLETOE.

Table 10

YIELDS PER ACRE OF SOUTHWESTERN PONDEROSA PINE, STAND NUMBER 3., UNDERSTORY.

SITE INDEX 67

THINNING INTENSITY-- INITIAL- 90, SUBSEQUENT- 90.

STND 3 SHEEP CORRAL II SILVER CITY GILA 76

CHARACTERISTICS BEFORE AND AFTER THINNING

PERIODIC INTERMEDIATE CUTS

STAND AGE (YEARS)	DMR	TREES NO.	BASAL AREA SQ.FT.	AVERAGE D.B.H. IN.	AVERAGE HEIGHT FT.	TOTAL VOLUME CU.FT.	MERCHANT- ABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.	TREES NO.	BASAL AREA SQ.FT.	TOTAL VOLUME CU.FT.	MERCHANT- ABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.
60	.1	707	96	5.0	41	1710	430	0					
60	.0+	359	57	5.4	43	1000	350	0	348	39	710	80	0
70	.1	355	79	6.4	49	1480	890	0					
80	.1	349	99	7.2	55	1970	1440	0					
80	.0+	254	78	7.5	55	1550	1190	0	95	21	420	250	0
90	.1	252	99	8.5	60	2090	1760	1300					
100	.1	250	120	9.4	64	2780	2440	3900					
100	.0+	111	63	10.2	65	1470	1330	2800	139	57	1310	1110	1100
110	.1	111	79	11.4	68	1970	1810	6100					
120	.1	111	95	12.5	71	2510	2320	8500					
120	.0+	27	31	14.5	73	850	800	3300	84	64	1660	1520	5200
130	.1	27	39	16.2	76	1110	1060	4600					
140	.1	27	47	17.8	78	1390	1330	6200					
TOTAL YIELDS											5490	4290	12500

MERCH. CU. FT. - TREES 6.0 INCHES D.B.H. AND LARGER TO 4.0-INCH TOP.

BD. FT. - TREES 10.0 INCHES D.B.H. AND LARGER TO VARIABLE TOP LIMIT.

INITIAL THINNING MUST BE FROM BELOW.

DWARF MISTLETOE RATING ABOVE WHICH PERIODIC THINNINGS WILL NOT BE EXECUTED - 3.0.

MINIMUM CUTS FOR INCLUSION IN TOTAL YIELDS-- 1. CUBIC FEET AND 1. BOARD FEET.

ALL THINNINGS MAY BE NONCOMMERCIAL.

AT INITIAL AGE 60., 6. PERCENT OF THE TREES WERE INFECTED WITH DWARF MISTLETOE.

Table 11

YIELDS PER ACRE OF SOUTHWESTERN PONDEROSA PINE, STAND NUMBER 3., UNDERSTORY.

SITE INDEX 67

THINNING INTENSITY-- INITIAL- 90. SUBSEQUENT- 100.

STND 3 SHEEP CORRAL II SILVER CITY GILA 76

CHARACTERISTICS BEFORE AND AFTER THINNING

PERIODIC INTERMEDIATE CUTS

STAND AGE (YEARS)	DMR	TREES NO.	BASAL AREA SQ.FT.	AVERAGE D.B.H. IN.	AVERAGE HEIGHT FT.	TOTAL VOLUME CU.FT.	MERCHANT- ABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.	TREES NO.	BASAL AREA SQ.FT.	TOTAL VOLUME CU.FT.	MERCHANT- ABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.
60	.1	707	46	5.0	41	1710	430	0					
60	.0+	359	57	5.4	43	1000	350	0	348	39	710	80	0
70	.1	355	79	6.4	49	1480	890	0					
80	.1	349	99	7.2	55	1970	1440	0					
80	.0+	287	86	7.4	55	1710	1290	0	62	13	260	150	0
90	.1	285	110	8.4	60	2310	1930	1400					
100	.1	282	130	9.2	64	2990	2610	3800					
100	.0+	128	70	10.0	64	1620	1450	2900	154	60	1370	1160	900
110	.1	127	85	11.1	68	2130	1940	6000					
120	.1	127	101	12.1	71	2680	2470	8900					
120	.0+	33	35	14.0	73	970	910	3600	94	66	1710	1560	5300
130	.1	33	44	15.6	76	1250	1190	5100					
140	.1	33	53	17.1	78	1560	1490	6800					
TOTAL YIELDS											5610	4440	13000

MERCH. CU. FT. - TREES 6.0 INCHES D.B.H. AND LARGER TO 4.0-INCH TOP.

BD. FT. - TREES 10.0 INCHES D.B.H. AND LARGER TO VARIABLE TOP LIMIT.

INITIAL THINNING MUST BE FROM BELOW.

DWARF MISTLETOE RATING ABOVE WHICH PERIODIC THINNINGS WILL NOT BE EXECUTED - 3.0.

MINIMUM CUTS FOR INCLUSION IN TOTAL YIELDS-- 1. CUBIC FEET AND 1. BOARD FEET.

ALL THINNINGS MAY BE NONCOMMERCIAL.

AT INITIAL AGE 60., 6. PERCENT OF THE TREES WERE INFECTED WITH DWARF MISTLETOE.

Table 12